U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Kinosternon sonoriense longifemorale*

COMMON NAME: Sonoyta mud turtle

LEAD REGION: Region 2

INFORMATION CURRENT AS OF: October 2005

STATUS/ACTION:

___ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status
___ New candidate
_X_ Continuing candidate
___ Non-petitioned
_X__ Petitioned - Date petition received: 11 May 2004
_ 90-day positive - FR date:
_ 12-month warranted but precluded - FR date:
_ Did the petition requesting a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:
a. Is listing warranted (if yes, see summary of threats below)? Yes
b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? Yes
c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded.
During the past 12 months, almost our entire national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, emergency listings, and essential litigation-related, administrative, and program management functions. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the 12 months, see the discussion of "Progress on Revising the Lists," in the current CNOR which can be viewed on our Internet website (http://endangered.fws.gov/).
___ Listing priority change
Former LP: ___
New LP: ___
Date when the species first became a Candidate (as currently defined): August 17, 1997

___ Candidate removal: Former LP: ___
___ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

___U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.
___ F – Range is no longer a U.S. territory.
___ I – Insufficient information exists on biological vulnerability and threats to support listing.
___ M – Taxon mistakenly included in past notice of review.
___ N – Taxon does not meet the Act's definition of "species."
___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Reptiles, Kinosternidae

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Sonora, Mexico and Arizona

CURRENT STATES/ COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Sonora, Mexico and Pima County, Arizona

LAND OWNERSHIP: In the United States, 100 percent of the turtle's habitat is owned by the National Park Service.

LEAD REGION CONTACT: Susan Jacobsen, 505-248-6641

LEAD FIELD OFFICE CONTACT: Marty Tuegel, Arizona Ecological Services Field Office, Tucson, 520-670-6150 x232

BIOLOGICAL INFORMATION: The Sonoyta mud turtle (*Kinosternon sonoriense longifemorale* Iverson) is an isolated endemic subspecies with a small distribution along the United States/Mexico international border in southwestern Arizona and northwestern Sonora. It occurs in only one locality in the United States at Quitobaquito Springs in Organ Pipe Cactus National Monument, Arizona, and in one stream, the Rio Sonoyta, and one spring, Quitovac, in Sonora, Mexico (Rosen 2003). The Sonoyta mud turtle is a dark, medium-sized (shell to 17.5 cm), aquatic turtle with a mottled pattern on the head, neck, and limbs. The upper shell (carapace) is olive brown to dark brown with dark seams; the lower shell (plastron) is hinged, front and rear, and yellow to brown. Long barbels are typically present on the chin, and all four feet are webbed. The species feeds primarily on aquatic invertebrates and plants, although fish and other vertebrates are also eaten (Hulse 1974). Sonoyta mud turtles become mature at 3-4 years, and live as long as 25 years. Females deposit an average of 1.5 clutches per year with an average of 4 eggs per clutch from July-September, buried in soil on land (Rosen and Lowe 1996).

The subspecies was once abundant at Quitobaquito, but the population declined from probably several hundred in the 1950s to less than 100 in the late 1980s. Juvenile survivorship has increased in recent years; population estimates in 1995 were about 130 individuals (Rosen and Lowe 1996a), and more recently, 134 in 2002 (Arizona Game and Fish Department, unpublished data). Habitat at Quitobaquito consists primarily of small ponds, although turtles may use the nearby springs and spring channels.

In Mexico, the subspecies inhabits an intermittent reach of the Rio Sonoyta approximately 2-4 km upstream of the town of Sonoyta, an ephemeral dam pool and a sewage lagoon near Sonoyta, and a reach that begins some 15 km downstream of Sonoyta intermittently near Santo Domingo, continuing for several km through a perennial reach in the northwestern corner of the Pinacate and Grand Desierto Biosphere Reserve (Rosen 2003). A new population was discovered in an isolated portion of the Rio Sonoyta drainage in March 2002 at Quitovac, Mexico, a ca. 1-hectare spring complex approximately 40 km south of the town of Sonoyta (Knowles et al. 2002). The size of the Quitovac population is estimated at about 200 (Rosen 2003). Rosen (2003) estimates the combined population size to be 1200 individuals (range 600-2700). Results from a recently completed population genetics study (Rosen 2003) indicate that the Quitobaquito/Rio Sonoyta populations are distinct from all other Arizona-New Mexico populations of *Kinosternon sonoriense*, which is consistent with the taxonomy developed by Iverson (1981) based on morphology of the carapace.

THREATS

A. <u>The present or threatened destruction, modification, or curtailment of its habitat or range</u>. Quitobaquito is a dredged and impounded pond fed by springs and seeps in nearby granite outcrops. Flow from springs may have been connected to the Rio Sonoyta via surface flows in recent times, but is now separated by approximately 1.5 km of Sonoran Desert and Mexico Highway 2. The effects of the original dredging and impoundment on the Sonoyta mud turtle are unknown. However, the imperiled status of the turtle was apparently unknown to National Park Service personnel for many years. The pond at Quitobaquito was drained twice to eliminate nonnative fish and enhance habitat for the endangered desert pupfish. During these drying episodes many turtles were collected and given away as pets (Rosen 1986). The Park Service has since recognized the unique nature of the turtle population and has become sensitive to its management needs.

Rio Sonoyta is a disjunct stream of the Colorado River system that was likely isolated in the Pinacate Region during a volcanic activity period in the Pleistocene (Ives 1936, Hubbs and Miller 1948). Aquatic habitat in the Rio Sonoyta is being lost and degraded due to groundwater pumping, livestock grazing, urbanization, and pesticide application (McMahon and Miller 1982, Hendrickson and Varela-Romero 1989, Brown 1991, Rutman 1997). Increase in the amount of groundwater withdraw, changes in the treatment of waster water, or introduction of nonnative bullfrogs (*Rana catesbeiana*) and/or large predaceous fish to the Rio Sonoyta could result in extirpation of the subspecies from this system.

B. <u>Overutilization for commercial, recreational, scientific, or educational purposes</u>. The subspecies has been illegally collected at Quitobaquito (Rosen and Lowe 1996b), but the extent of this activity is unknown. Collecting pressure in the Rio Sonoyta is unknown. Because of low population sizes and reproductive potential, any collecting, particularly of adult female turtles, could be critical to population viability.

C. <u>Disease or predation</u>. No nonnative predators capable of consuming mud turtles or their eggs are known from Quitobaquito or the Rio Sonoyta, with the exception of feral and domestic cats and dogs in and near Sonoyta. Introduction of nonnative bullfrogs is a potential threat.

Bullfrogs are known to prey on turtles and may be capable of impacting populations of mud turtles (Schwalbe and Rosen 1988). Likewise, nonnative crayfish are known to prey on the Sonoran mud turtle (Scwendiman 2001) and their introduction has resulted in apparent marked population reductions at one Arizona locality (Fernandez and Rosen 1996). Concern has also been expressed over possible nonnative fish introduction into Quitobaquito. Some nonnative species, such as largemouth bass (*Micropterus salmoides*), are capable of preying on mud turtles. However, as yet largemouth bass are not known from any of the habitats currently supporting the turtle. Red bellied tilapia (*Tilapia zilli)* have been documented at Quitovac, and mosquitofish and black bullhead (*Amieurus melas*) occupy the Rio Sonoyta (Hendrickson and Varela-Romero 1989, Rosen 2003). In October 2003, a tilapia was observed in the Rio Sonoyta which was not captured (U.S. Fish and Wildlife Service files). Although these nonnative species are not considered a threat to the mud turtle, they may have some adverse effects on the native fish fauna in the Rio Sonoyta, the endangered Quitobaquito pupfish (*Cyprinodon eremus*) and longfin dace (*Agosia chrysogaster*)

A study of turtles found dead between 1989 and 1993 and pond sediments from Quitobaquito Springs was conducted. Mud turtles from Quitobaquito exhibited relatively low body lipid (fat) reserves, indicating a possible dietary deficiency. Relatively high levels of boron, chromium, selenium, strontium, and zinc in mud turtle tissues, combined with low availability of protein rich foods may be limiting turtle survival (King et al. 1996). Low lipid reserves may also result in reduced egg production. Pesticide use in agricultural lands along the Rio Sonoyta may contaminate habitats of the turtle: low levels of DDE metabolites and Dacthal, an herbicide, were found in mud turtles from Quitobaquito since 1981 (Rosen and Lowe 1996a). The effects of such pesticides on this species are unknown

D. <u>The inadequacy of existing regulatory mechanisms</u>. Collection of mud turtles in Organ Pipe Cactus National Monument, Arizona is illegal except by special permit from the National Park Service. However, law enforcement coverage is limited and some illegal collection occurs. Arizona State law does not prohibit collection of the Sonoyta mud turtle; the bag limit is four per year, live or dead.

E. <u>Other natural or manmade factors affecting its continued existence</u>. Aquatic habitat in the Rio Sonoyta is extremely dynamic due to climatic extremes (Ives 1936, Hendrickson and Varela-Romero 1989). Mud turtle populations are likely reduced due to this dynamic nature. Because turtle populations have a low intrinsic population growth rate, they are incapable of expanding rapidly to take advantage of temporary habitats created by periods of high precipitation, but populations can decline rapidly during drought years. Also, populations of mud turtles are relatively small. Small populations are vulnerable to environmental and demographic random events, which increase the probability of extinction (Shafter 1990).

CONSERVATION MEASURES PLANNED OR IMPLEMENTED: The Service has begun discussions with Organ Pipe Cactus National Monument about the status of and potential conservation measures for this subspecies. The Phoenix Zoo has expressed interest in propagating Sonoyta mud turtles and perhaps establishing a captive population on the zoo grounds. A mailing list has been prepared for the prenotification status summary and information letter. Contracts have been let to Phil Rosen, University of Arizona, and IMADES,

Hermosillo, Sonora, to define the status and distribution of the turtle in Sonora. The Arizona Game and Fish Department has a Section 6 grant with the Service to develop a Conservation Agreement for the Sonoyta mud turtle. The Quitobaquito and Rio Sonoyta Working Group has been formed with the agencies and interested parties in the United States and Mexico to assist in development of a conservation plan and agreement for the species. New information collected in 2003 is reflected in this summary.

SUMMARY OF THREATS: This subspecies inhabits Quitobaquito spring in Organ Pipe Cactus National Monument in the United States and the Rio Sonoyta in Sonora, Mexico and should be maintained as a Candidate species. The habitat in Quitobaquito consists of man-made ponds which are maintained through periodic dredging. Aquatic habitat in the Rio Sonoyta is being lost and degraded due to groundwater pumping, livestock grazing, urbanization, and pesticide application (McMahon and Miller 1982, Hendrickson and Varela-Romero 1989, Brown 1991, Rutman 1997). The subspecies has been illegally collected at Quitobaquito, and law enforcement coverage is limited and Arizona State law does not prohibit collection or possession of the Sonoyta mud turtle. No nonnative predators capable of consuming mud turtles or their eggs are known from Quitobaquito or the Rio Sonoyta, with the exception of feral and domestic cats and dogs in and near Sonoyta. Dietary deficiencies have been documented in Quitobaquito Springs population; and heavy metal and pesticide contamination has also been found in both populations. The aquatic habitat in the Rio Sonoyta is extremely dynamic due to climatic extremes, existing populations of mud turtles are relatively small, and turtle populations have a low intrinsic population growth rate; therefore these populations are extremely sensitive to environmental events, which increase the probability of extinction.

For species that are being removed from candidate status:
___Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	**Imminent**	Monotypic genus	1
		Species	2
		Subspecies/population	**3***
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10

		Species Subspecies/population	11 12

Rationale for listing priority number:

Magnitude: The primary threat to the Sonoyta mud turtle is water development and its limited distribution. One small population occurs in the United States, in a spring pool less than an acre in size at Quitobaquito Springs, Organ Pipe Cactus National Monument. Populations in Mexico are similar in scale: a population in the Rio Sonoyta exists in short perennial reaches totaling only a few kilometers in length, and a similarly sized population of in a spring pool complex at Quitovac. Farming and development in the region continues to place demands on groundwater, and surface water amounts are very limited and likely to continue to decrease. The pond at Quitobaquito could be affected by hydrologic changes in the Rio Sonoyta (Carruth 1996). The presence of surface waters that the subspecies depends upon both in the United States and Mexico is highly dependent on land use and wastewater return flows. Changes in the current management of water resources of the Rio Sonoyta drainage could potentially result in extinction of the subspecies.

Imminence: The Sonoyta mud turtle is highly aquatic (Rosen and Lowe 1996a). Irrigated agriculture is widespread in the Rio Sonoyta Valley, and continued development in the towns of Sonoyta and Lukeville will also place demands on water supplies (Brown 1991). Surface water in the Rio Sonoyta is therefore likely to decrease. This is also dependent on the use of wastewater in Sonoyta, which at present is largely returned to the river untreated. These small remnant populations could be rapidly eliminated by surface and ground water withdrawal and changes in the treatment of wastewater. The introduction of nonnative predators such as bullfrogs or crayfish could also rapidly eliminate such small populations (Fernandez and Rosen 1996). Stochastic events such as floods, variations of annual weather patterns, predation and associated demographic uncertainty (conditions affected by chance events, such as sex ratios, that influence survival and reproduction in small populations), or other environmental stresses and human-caused factors such as chemical spills, could also lead to the rapid demise of these remnant populations.

_X_ Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed? Yes

Is Emergency Listing Warranted? No. Population estimates of the United States population of Sonoyta mud turtles indicate that it has remained stable since the mid-1990s. Monitoring of the Mexico population in 2001-2004 indicates it also is stable. Although both populations remained threatened by their small size and limited distribution, current information does not suggest that emergency listing is warranted.

DESCRIPTION OF MONITORING: Monitoring is being conducted by the University of Arizona, U.S. Fish and Wildlife Service, Arizona Game and Fish Department, IMADES, Organ Pipe Cactus National Monument, and the Pinacate and Grand Desierto Biosphere Reserve. Monitoring is done at least annually and in some cases biannually in the United States and Mexico. Methods consist of trapping turtles, measuring, aging, sexing and marking. Monitoring

data can be used to generate Jolly-Seber type statistical population estimates.

COORDINATION WITH STATES

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment: Arizona. Coordination occurs through the informal Quitobaquito/Rio Sonoyta Working Group, which meets annually. Membership includes:

Arizona:
- Arizona Game and Fish Department
- University of Arizona
- Sonoran Institute (NGO)

Sonora, Mexico:
- IMADES – Instituto del Medio Ambiente y el Desarrollo Sustentable del estado de Sonora
- Reserva el Pinacate

Federal:
- National Park Service – Organ Pipe National Monument
- U.S. Fish and Wildlife Service- Arizona Ecological Services Office

Indicate which State(s) did not provide any information or comments: NA

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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: /s/ Rich McDonald 11/17/2005
Regional Director, Fish and Wildlife Service Date

Concur: August 23, 2006
Director, Fish and Wildlife Service Date

Do not concur: _____
Director, Fish and Wildlife Service Date

Date of annual review: October 2005
Conducted by: Marty Tuegel